IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
Yodh et al.

Confirmation No.: **7568**

Application No.: **10/526,941**

Group Art Unit: **1793**

Filing Date: **September 8, 2005**

Examiner: **Martinez, Brittany M.**

For: **Carbon Nanotubes: High Solids Dispersions and Nematic Gels Thereof**

DECLARATION OF DR. ARJUN G. YODH UNDER 37 CFR § 1.132

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I, Arjun G. Yodh, Ph.D., hereby declare the following:

1. I am a co-inventor of the above-captioned patent application ("the subject application"). A portion of my Curriculum Vitae is attached hereto as **Exhibit A**. Among my credentials, I received a Ph.D. from the *Division of Applied Sciences* at Harvard University, and I was a Postdoctoral research associate at AT&T Bell Laboratories in Murray Hill, New Jersey. I am presently James M. Skinner Professor of Science and Director of the *Laboratory for Research on the Structure of Matter* at the University of Pennsylvania in Philadelphia, Pennsylvania. My primary appointment at the University is in the *Department Physics & Astronomy*, and I also have a secondary appointment in the *Department of Radiation Oncology* of the Medical School at the University. I am also a member of the *Institute of Medicine and Engineering*, and I am in the graduate group of the *Department of Bioengineering* in the School of Engineering at the University.

2. It is my understanding that claims 1-13, 15-30, 35-52, 55-57, and 61-138 of the subject application are directed to carbon nanotubes and a surfactant comprising an aromatic

group capable of pi-like stacking that is adsorbed to the exterior surface of said carbon nanotubes.

3. I have reviewed the office action dated February 22, 2010. As I understand it, the examiner has rejected claims 1-13, 15-30, 35-52, 55-57, and 61-138 because they are allegedly obvious in light of the prior art, in particular U.S. Patent Number 5,648,523 to Chiang. The examiner relies on Chiang's Example 2 (column 10, lines 30-56).

4. This declaration is made to demonstrate that our invention does not claim water-soluble polyhydroxylated fullerene derivatives, as disclosed in Chiang, Example 2. For example, as we described in paragraph [0017] of our patent application, generally, the chemically modified carbon nanotubes (e.g., polyhydroxylated nanotubes) are less desirable because their band structures can differ from the unmodified nanotubes. Hence, one of ordinary skill in the art would not be motivated to look to Chiang's disclosure of combining certain surfactants with polyhydroxylated nanotubes to give rise to any of our inventions as claimed.

5. In addition, the surface chemistry and chemical bonding of C_{60} and C_{70} is not expected to be the same as that of carbon nanotubes. For example, the chemical bonding of nanotubes is composed essentially of sp^2 bonds, whereas spherical fullerenes such as C_{60} and C_{70} also have a number of pi-bonding electrons. These pi-bonding electrons give rise to different surface and adsorption properties among carbon nanotubes and C_{60} and C_{70}. Hence, one of ordinary skill in the art would not be motivated to look to Chiang's disclosure of combining certain surfactants with C_{60}, C_{70}, or derivatives of C_{60} or C_{70} to yield any of our inventions as claimed.

6. I further declare that all statements made herein of my knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under § 1001 of Title 18 of the United States Code,

and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: June 22, 2010

Arjun G. Yodh

Attachments: Exhibit A

EXHIBIT A

Arjun G. Yodh

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Education

1986 Ph.D. Applied Sciences, Harvard University, Boston, MA
1982 M.S. Applied Sciences, Harvard University, Boston, MA
1981 B.Sc. Applied and Engineering Physics, Cornell University, Ithaca, NY

Work Experience

1997- *Professor*, Physics and Astronomy
Professor, Radiation Oncology
University of Pennsylvania, Philadelphia, PA

1993-1997 *Associate Professor*, Physics
University of Pennsylvania, Philadelphia, PA

1988-1993 *Assistant Professor*, Physics
University of Pennsylvania, Philadelphia, PA

1987-1988 *Postdoctoral Research Associate*
with Dr. Harry W.K. Tom, AT&T Bell Laboratories, Murray Hill, NJ

1986-1987 *Postdoctoral Research Associate*
with Dr. Steven Chu, AT&T Bell Laboratories, Murray Hill, NJ

1982-1986 *Research Assistant*
with Dr. Thomas W. Mossberg, Harvard University, Boston, MA

Honors, Appointments, and Fellowships

2000- James M. Skinner Professor of Science, Endowed Chair
University of Pennsylvania
2009- Director, Laboratory for Research on Structure of Matter
University of Pennsylvania
2009- Director, NSF Materials Research Science & Engineering Center,
University of Pennsylvania
2004-2009 MRSEC Deputy Director, Laboratory for Research on Structure of Matter
University of Pennsylvania
2006 Langmuir Lecturer (ACS Division of Colloid and Surface Chemistry)
University of Pennsylvania

EXHIBIT A

2000-2002	Sigma Xi National Lecturer in Science
1997-2000	William Smith Term Chair, University of Pennsylvania
1991-1994	Office of Naval Research Navy Young Investigator
1991-1994	Alfred P. Sloan Research Fellow
1990-1995	National Science Foundation Presidential Young Investigator
1990-1993	AT&T Bell Laboratories Faculty Fellow
1988-1989	Lilly Foundation Faculty Teaching Fellow
1983-1986	U.S. Army Pre-Doctoral Fellowship, Harvard University
1977-1981	Cornell National Scholar, Cornell University
1976-1977	Westinghouse Science Nationwide Talent Search (Top 40)

Current Research Interests

Condensed Matter Physics: Soft materials and complex fluids including – glasses, frustration, Browian motion, the jamming transition, premelting in bulk crystals, melting of layered phases of rods in temperature sensitive polymer, capillary interactions between anisotropic colloidal particles, biopolymers in anisotropic (nematic) fluids, mechanical responses of soft materials, entropy-driven colloidal interactions and self-assembly; Carbon nanotubes, including – solubilization of single-wall carbon nanotubes in aqueous suspensions, nematic nanotube gels, optical properties and anisotropy of single-wall carbon nanotubes, structure and rheology of single-wall carbon nanotube suspensions, single wall carbon nanotube epoxy composites; Hard surfaces and interfaces, including – nonlinear optical spectroscopy of interfaces/surfaces/particles, and ultrafast spectroscopy of surfaces and surface adsorbates.

Biomedical Optics: Spectroscopy and imaging with diffusing light; Functional imaging and spectroscopy of brain, breast, and muscle; Photodynamic therapy.

Atomic, Molecular & Optical Science: Light forces; Confocal microscopy; *In vivo* GRIN lens two-photon based fluorescence microscopy; Center for Advanced Imaging and Micromanipulation; Scattering; Diffusing light optics, imaging, spectroscopy; Nonlinear optical scattering, spectroscopy and microscopy; Optical information storage, laser physics, new mid-infrared sources; Atomic and molecular physics.